Site: Big River Mine
ID #: [illegible]
Break: 17.8
Other: 8-89

PORTABLE METEOROLOGICAL STATION

INSTRUCTION MANUAL

40111372
SUPERFUND RECORDS

REVISION: 8/89

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PORTABLE METEOROLOGICAL STATION

TABLE OF CONTENTS

TABLES

SECTION 1. DESCRIPTION

Components which make up the Portable Meteorological Station (PMS) provided by Campbell Scientific, Inc. are:

* 20 foot mast
* CR10 Measurement and Control Module (CR10)
* CR10KD Keyboard Display (CR10KD)
* SM192 Storage Module (SM192)
* Sensors for wind speed and direction, temperature, relative humidity, barometric pressure and tipping bucket rain gage
* PC208 Datalogger Support Software (PC208)
* SC532 Storage Module interface (SC532)
* SC32A RS232 interface (SC32A)

The CR10 is a battery powered programmable datalogger that measures the sensors and stores processed data. Approximately 5,300 data values can be stored in the CR10's "ring" memory before the oldest data are written over. Data are also stored in the SM192, which can store approximately 96,000 data values. The CR10 verifies that the SM192 is connected before sending new data. If it is not connected, new data are buffered in the CR10 and output to the SM192 when it is reconnected.

Data can be retrieved directly from the CR10, or from the SM192 using an IBM compatible computer with PC208 Datalogger Support Software, and the appropriate interface (Sections 4.8 and 5.0 of this manual).

SECTION 2. FIELD INSTALLATION

2.1 TRANSIT CASES

The PMS station is transported in: 1) a fiberglass transit case for the instrument enclosure, CR10, SM192, sensors and mounting hardware, 2) a cylindrical pvc case for the mast, and 3) a nylon bag for the hammer, stakes and guys.

2.2 SITE SELECTION

Choose an area of firm ground, which should be as flat as possible. Do not attempt to erect the mast on a site which slopes by more than 20 degrees.

2.3 ASSEMBLY

1. A suitable site having been chosen, check that there is sufficient space for the pickets and guys.

2. With the legs folded, hold the mast in an upright position. If the station has a solar panel, orient the mast so that the bracket for the solar panel faces south.

3. Unscrew the thumbscrews on the legs (see Figure 1 in Clark Mast (CM) Handbook). Extend each leg, pushing the base firmly into the ground, and then tightening the thumbscrew.

4. The casting to which the mast legs are attached has a bolt through two flanges which secure the position of the mast in the casting. Loosen the bolt and rotate the mast until the arrow on the mast is lined up with the split in the casting and tighten the bolt.

5. Open the fiberglass transit case and remove the (4) knobs securing the instrument enclosure.

6. Secure the instrument enclosure to studs on the bottom section of the mast using (4) knobs.

7. Plumb the mast using the bubble level in the bottom of the enclosure and by adjusting the legs.

8. Remove the wind sensor and mounting plug from the fiberglass transit case. Insert the mounting plug into the wind sensor, making sure that the key is engaged;

tighten the hose clamp on the sensor using a screw driver. Attach the wind sensor to the top of the mast by inserting the mounting plug into the top mast section and tightening the collar (rotate the spigot to line-up the keyway). Secure the sensor lead just below the guy collar using a 6 3/4" velcro tie.

9. Attach the (4) guys to the guy collar (see Figure 2 in CM Handbook).

10. Arrange the (4) pickets at an equal distance from each other and at the correct distance from the mast (see Figure 3 in CM Handbook). Drive the pickets into the ground at least 2/3 of the length; they should lean away from the mast (see Figure 4 in the CM Handbook).

11. Attach the mast guys to their respective pickets, but do not tension them.

12. Close the air release valve on the handpump (see Figure 6 CM Handbook). Close the drain valve at the foot of the mast (see Figure 7 CM Handbook).

13. Make sure that all the locking collars are secured except for the top section. Pump the mast with the handpump until the top section is fully extended. Lock the the extended section with the locking collars. Release the next collar, pump up the next section a few inches and secure the sensor lead with a 6 3/4" velcro tie. Pump until section is fully extended and then lock in position. Repeat the process with the other sections using the 9 3/8" velcro ties.

14. Tension the mast guy ropes, do not use excess tension.

15. Open the air release valve on the handpump and open the drain valve in the mast base.

16. Remove the sensor crossarm bracket and crossarm(s) from the fiberglass transit case. Remove the knob assembly from the radiation shield bracket and slide the bracket forward to the end hole on the crossarm; secure the bracket position with the knob assembly. Insert the crossarm with the radiation shield into the upper sleeve of the crossarm bracket, and the crossarm with the rain gage into the lower sleeve. Tighten the (4) knobs to secure.

17. Attach the saddle bracket on the crossarm assembly to the mast so that the radiation shield is at 2 meters (approximately 6 1/2" from the top of the bottom section of the mast to the bottom of the crossarm bracket).

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18. Secure the sensor lead wires to the mast using a 12" velcro tie. Attach the connectors on the sensor leads to the bulkhead connectors on the enclosure. If the system has a solar panel, attach the panel to the bracket on the mast using the (2) knobs provided, and connect the cable to the mating connector on the enclosure.

19. Drive the copper ground rod and attach the ground wire from the copper lug on the enclosure using the ground clamp.

SECTION 3. POWERING THE CR10 AND PROGRAMMING OPTIONS

The CR10 datalogger is powered by (8) alkaline D cell batteries (or, by lead acid batteries when RF telemetry is used). When power is applied to the CR10, the message HELLO will appear on the CR10KD, followed by 48 (K bytes of memory).

NOTE: Absolute minimum battery voltage is 9.6V DC when using alkaline batteries, or 11.76V DC when using lead acid batteries. Battery voltage can be measured by the CR10 and displayed in the *6 Mode.

There are two methods of programming and retrieving data from the CR10. When a portable computer can be taken to the field site, the CR10 can be accessed directly using the SC32A interface. TERM is used to set the clock and to download the program, TELCOM is used to retrieve the data (see Section 5.0 of this manual).

When a portable computer can not be taken to the field, the CR10KD is used to set the clock and to download a program from the SM192. To retrieve the data, the SM192 is taken to the computer and read using the SC532 interface and the program SMCOM (see Section 4.0 of this manual).

SECTION 4. PROGRAMMING AND DATA RETRIEVAL USING THE CR10KD AND THE SM192

4.1 *5 MODE - SETTING AND DISPLAYING THE CLOCK

The *5 Mode is used to display time or to change the year, day or time. When "*5" is entered, the time is displayed and updated approximately every second. The sequence of parameters displayed in the *5 Mode is given in Table 4.1.

To set the year, day, or time, enter the *5 Mode and advance to display the appropriate value. Key in the desired number and enter the value by keying "A". When a new value for hours and minutes in entered, the seconds are set to zero and current time is again displayed.

TABLE 4.1. Sequence of Time Parameters in *5 Mode

Key	Display ID:DATA	Description
*5	:HH:MM:SS	Display current time
A	05:XX	Display/enter year
A	05:XXXX	Display/enter day of year
A	05:HH:MM:SS	Display/enter hours:minutes

4.2 *D MODE - SAVE OR LOAD PROGRAM

The *D Mode is used with the Storage Module to save or load program information. When "*D" is keyed, the CR10 will display "13:00". A command (Table 4.2) is entered by keying the command number and "A".

TABLE 4.2. Storage Module Command Options

Command	Option Code Description
7N:00	(N is Storage Module Address, default is 1)
	1x Save Program X to Storage Module (x = 1-8)
	2x Load Program X from Storage Module
	3x Erase Program X in Storage Module

For Example, key *D 71A 23A to download program 1 from the Storage Module to the CR10.

Typically, the program editor EDLOG is used to develop a program, and SMCOM is used to store the program in the SM192.

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EDLOG and SMCOM are programs contained in the PC208 software (see the PC208 Manual).

4.3 *0 MODE - START EXECUTION OF PROGRAM TABLES

When a program is first entered, or if any changes are made, the program must be compiled before it starts running. The compile function checks for programming errors and optimizes program information for use during program execution. If errors are detected, the appropriate error codes are displayed. The compile function is executed when the *0, *6, or *B modes are entered. When the *6 Mode is used to compile data values contained in Input Storage, the state of flags, control ports, and the timer are UNALTERED. Compiling always zeros Intermediate Storage.

4.4 *6 MODE - DISPLAYING INSTANTANEOUS SENSOR READINGS, FLAGS, AND PORTS

After the sensors are connected, and the CR10 is programmed, the instantaneous sensor readings may be displayed in the *6 Mode. When "*6" is keyed, the display will read "06:0000". One can advance to view the value stored in Input location 1 by keying "A". *6 commands are described in Table 4.4.

To go directly to a specific location, key in the location number before keying "A". For example, to view the value contained in Input Storage location 3, key "*63A". The ID portion of the display shows the last 2 digits of the location number. The value on the display is the result of the most recent scan.

TABLE 4.4. *6 Command Summary

*6 Mode Commands

Key	Action
A	Advance to next input location
B	Back-up to previous location
C	Change value in Input location (followed by keyed in value, then "A")
D	Display/alter flags
0	Display/alter ports
#	Display current location and allow a location no. to be keyed in, followed by a "A" to jump to that location

In the sample program provided, the sensors are scanned every 15 seconds. Input locations 1 - 8 contain the following values:

Location	Sensor
1	Wind Speed - degrees
2	Wind Direction - meters/second
3	Temperature - degrees Celsius
4	Relative Humidity - percent
5	Barometric Pressure - millibars
6	Battery Voltage - volts
7	Precipitation - .01" (optional)
8	Compass - degrees

If "D" is keyed while the CR10 is displaying a location value (e.g. *6AD), the current status of the user flags will be displayed in the following format: "00:010000". The characters represent flags 1 - 8, the left most digit is flag 1. In the above example, flag 4 is set. To toggle a flag, simply key the corresponding number.

The current status of the ports can be displayed by keying "0" while displaying a location value (e.g. *6A0). Ports are displayed left to right as C8..C1 (exactly opposite to the flags). In the sample program, Port 8 is checked by instruction 1. If port 8 is high, the rest of the program table is skipped. Port 8 is set high or low with the toggle switch inside the aluminum enclosure. The intent of the toggle switch is to allow the CR10 to programmed prior to installation. After the station is installed, the switch is toggled to have the CR10 execute the remaining program instructions.

Flag 2 is checked by the CR10 in the sample program. When flag 2 is low, the program enters a loop that measures the compass 10 times and places the averaged value in input location 8. Flag 2 is set high when the loop is finished. The loop to measure the compass can be re-initiated at any time by setting flag 2 low in the *6 Mode.

4.5 *7 MODE - DISPLAYING FINAL STORAGE DATA

Final Storage is displayed using the *7 Mode. Key "*7", the next window displays the current DSP location. Table 4.5 shows the format in which data from the sample program are stored in Final Storage (a new array is stored every 15 minutes).

TABLE 4.5. Sample Final Storage Array

01+0001 02+0187 03+1015 04+10.10 05+270.6 06+04.27 07+24.57
08+84.45 09+867.4 10+12.67 11+0.00

Description of the Array Elements:

01	Array ID
02	Julian Day
03	Hour - Minute
04	Wind Speed
05	Wind Direction
06	Standard Deviation of Wind Direction
07	Temperature
08	Relative Humidity
09	Barometric Pressure
10	Battery Voltage
11	Precipitation

Keying "A" advances you to the Output Array ID of the oldest Array in the Storage Area. To locate a specific Output Array, enter a location number that positions the Display Pointer (DPTR) behind the desired data and press the "A" key. If the location number entered is in the middle of an Output Array, the DPTR is automatically advanced to the first data point of the next Output Array. Repeated use of the "A" key advances through the Output Array, while use of the "B" key backs the DPTP through memory.

The memory location of the data point is displayed by pressing the "#" key. Whenever a location number is displayed by using the "#" key, the corresponding data point can be displayed by pressing the "C" key.

The same element in the next Output Array with the same ID can be displayed by hitting "#A". The same element in the previous Array can be displayed by hitting "#B". Keyboard commands used in the *7 Mode are summarized in Table 3.5.1.

TABLE 4.5.1. *7 Mode Command Summary

Key	Action
A	Advance to next data point
B	Back-up to previous data point
#	Display location number of currently displayed data point value
C	Display value of current location
#A	Advance to same element in next Output Array with same ID
#B	Back-up to same element in previous Output Array with same ID
*	Exit *7 Mode

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4.6 SM192 STORAGE MODULE

The SM192 Storage Module is a solid state storage module which provides 192,976 bytes of storage (96,000 data values). The SM192 is powered from the CR10, or an internal lithium battery when disconnected. Life expectancy of the lithium battery is approximately 6 years.

The Storage Module can be configured as either "ring" or "fill and stop". In the ring configuration (the default setting), new data are written over the oldest data. In addition to data storage, up to 8 datalogger programs can be stored in the Storage Module using the *D Mode, or SMCOM. Programs stored in the Storage Module can be downloaded to the CR10 using the CR10KD.

File marks are used to separate data files. A file mark is automatically placed in memory when plugged into the CR10, or can be placed in memory by user command.

The *9 Mode is used to command the Storage Module. Typically the only *9 command used with PMS will be to review storage module data (Table 4.6).

TABLE 4.6. *9 Commands for Reviewing Storage Module Data

where: X is the Storage Module Address (default address is 1)

Key Sequence	Description
*9XA7A	SM returns: 07:00 then enter: 0..5, 7 or 9, then press "A" where: 0 = Data since last dump 1 = Current file 2 = File before current file 3 = File before file 2 4 = File before file 3 5 = File before file 4 7 = From current DLP to SRP 9 = From oldest data to SRP

If no file is found, the display returns "07:00". At this point, the correct command can be entered. When a valid command is entered the ending address for that file is displayed. Then press:

A - to advance and display next data point
B - to back-up one data point
- to display location of displayed data followed by C to return to the data

4.7 STOP LOGGING DATA

Connect the CR10KD to the CR10 and verify that data has been stored in the SM192 Storage Module using the *9 Mode (see Section 4.6 of this manual). Toggle the switch inside the enclosure to the off position.

NOTE: The alkaline batteries should be removed before transit.

4.8 RETRIEVING DATA FROM THE SM192

Data are retrieved from the SM192 using an IBM compatible computer and the SC532 interface. Connect the SC532 between the SM192 and a serial port on the computer.

SMCOM is a program contained in the PC208 software which is used to retrieve data from the SM192. When SMCOM is executed, the user is asked for the COM port, type of interface, file name, and the data format (see the PC208 manual). Data retrieval from the SM192 can be further simplified by creating a batch file that executes SMCOM.

SMREPORT.BAT, listed below, is one of the sample batch files provided with each station. When the file is executed, SMCOM accesses the SM192 through COM1 and the SC532 interface. PSD.DAT is the root file in which all **uncollected data files are placed. All PSD.DAT files are combined into file PSD.DAT by the DOS copy command. SPLIT uses parameter file 15MIN.RPT to generate the final report from PSD.DAT (see PC208 Manual). The raw data are appended to file 15MIN.DAT, and the report with headings is written to file 15MIN.RPT (the previous report is over written).

SMREPORT.BAT

```
SMCOM 1 N PSD U C QUIT
COPY PSD.DAT+CR.LF+PSD*.* PSD.DAT
SPLIT 15MIN/R
COPY 15MIN.DAT+PSD.DAT 15MIN.DAT
DEL PSD*.*
REM RAW DATA IS IN FILE 15MIN.DAT
REM REPORT WITH HEADINGS IS IN FILE 15MIN.RPT
```

** A file mark is created whenever the SM192 is plugged into the CR10 or SC532. The "Collect All Uncollected Files" option is used in the batch file to ensure that all the data files are retrieved from the SM192. If there is more than one file, the first array of the second file will be appended without a carriage-return line-feed, which can be corrected with an editor.

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SECTION 5. PROGRAMMING AND DATA RETRIEVAL USING A COMPUTER

An IBM compatible computer can be used with the PC208 software and the SC32A interface for communications with the CR10. PC208 Datalogger Support Software has six programs (see the PC208 Manual):

EDLOG - Develop and edit datalogger programs
TERM - Set the clock, download programs, and monitor instantaneous sensor readings
TELCOM - Data retrieval over direct cable (SC32A), or modem links
SPLIT - Report generation and data analysis
SMCOM - Data retrieval from the SM192 (requires the SC532 interface)

A disk that contains a sample datalogger program and batch files is sent with each station. The batch files execute PC208 programs, which are described in Section 5.1.

Before executing the batch files, connect the 9 pin side of the interface to the connector between the CR10 and the SM192, and the 25 pin side to the computer's serial port.

5.1 SAMPLE BATCH FILES

Sample batch files have been included for programming the CR10, displaying instantaneous sensor readings, retrieving data, and generating custom reports. The batch files execute programs contained in the PC208 software, which access the CR10 via the SC32A interface, or RF telemetry (see Section XXX).

To execute a batch file, the file name (without the extension .BAT) is typed on the command line. For example, to program the CR10, make sure that the computer is in the right sub-directory, and type "PGM" (execute the file by hitting the enter key).

PGM.BAT

```
TERM DIRECT K Y D EE1 QUIT
```

Batch file which executes TERM, which calls the station using station file DIRECT.STN, sets the clock, and downloads the program EE1.DLD to the CR10.

Station file DIRECT.STN contains the information needed to call the station:

```
Telecommunications Parameters For Station: DIRECT
                          Datalogger Type: CR10
  Use Asynchronous Communications Adaptor: COM1
                Communications Baud Rate: 9600

Interface Device:
#1: END
```

MONITOR.BAT

```
TERM DIRECT M EE1 LOCS 1..8 QUIT
```

may have to do this

Batch file which executes TERM, which calls the CR10 and enters the monitor mode, using labels from EE1.DLD. Input locations 1 - 8 are displayed, and updated every 15 seconds. Flag and port status are also displayed.

just type this

REPORT.BAT

if use EE3

```
TELCOM STATION
SPLIT 15MIN/R
COPY 15MIN.DAT+PSD.DAT 15MIN.DAT
REM RAW DATA IS IN FILE 15MIN.DAT
REM REPORT WITH HEADINGS IS IN FILE 15MIN.RPT
```

for IBM download

Batch file which executes TELCOM. TELCOM executes the Script File STATION.SCR, which calls the station using Station File PSD.STN. TELCOM retrieves the data since last call, and creates file PSD.DAT. SPLIT is then executed using parameter file 15MIN.PAR, which creates the final reports with headings. The comma-delineated data from which the reports were generated is appended to the archive file 15MIN.DAT.

TELCOM.SCR Script file used by TELCOM:

```
Script File Name: STATION

Enter list of telcom commands:
    PSD/c
```

PSD.STN Station file used by TELCOM:

```
                Station File NAme: PSD

      Datalogger or Command Type: CR10              Security Code: 0
          Data Collection Method: Since Last Call; Create File; 1st Area
Nbr of Arrays to Backup on First Call: 0
                Data File Format: Comma Delineated ASCII
  Fix Datalogger Clock Using PC Clock: No
     Primary Call Interval (minutes):
  Recovery Call Interval #1 (minutes):
  Repetitions of Recovery Interval #1:
```


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```
  Recovery Call Interval #2 (minutes):
Maximum Time Call Will Take (minutes):
                    Next Time To Call:
      Interface Devices:
      COM1                  Baud Rate: 9600
      End

SPLIT parameter file:

15MIN.PAR

     Name(s) of input DATA FILE(s): PSD.DAT
   Name of OUTPUT FILE to generate: 15MIN.PRN/R
         START reading in PSD.DAT: 2[3]
          STOP reading in PSD.DAT:
                Copy from PSD.DAT: 1[1]
    SELECT element #(s) in PSD.DAT: DATE (2;1989.0), 3..11
              HEADING for report: 15 MINUTE METEOROLOGICAL DATA
     HEADINGS for PSD.DAT, col #1: DATE
                          column #2: HR/MIN
                          column #3: WIND\M/S
                          column #4: WIND\DEG
                          column #5: STD DEV\DIREC
                          column #6: TEMP\DEG C
                          column #7: RH\%
                          column #8: BARO\PRESS
                          column #9: BATTERY\VOLTS
                         column #10: PRECIP\.01"
```

5.2 SAMPLE CR10 PROGRAM

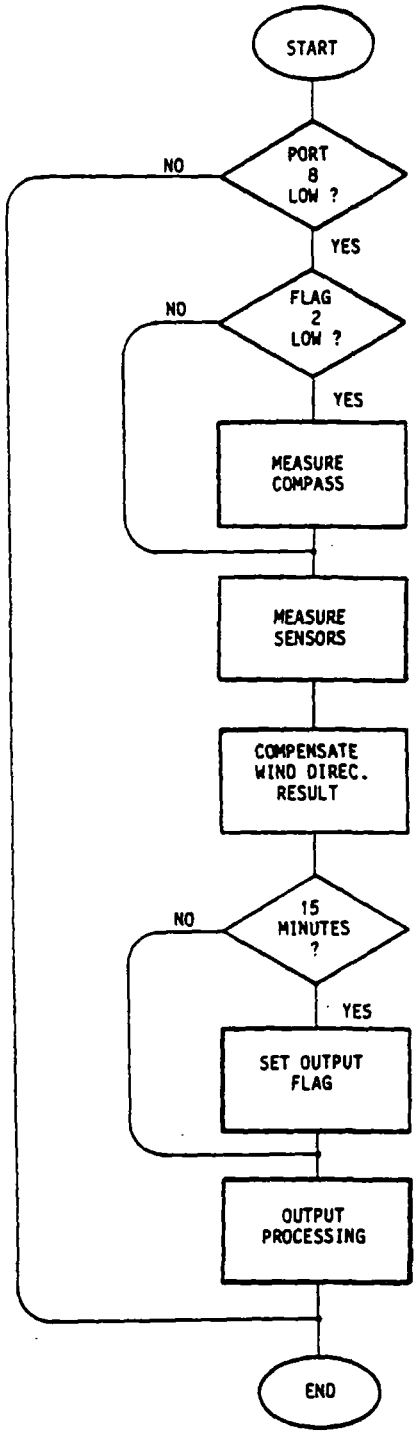

FIGURE 5.2. Flow Chart for Sample CR10 Program

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Sample CR10 Program (continued)

```
*     1        Table 1 Programs
  01: 15       Sec. Execution Interval

01:  P91       If Flag/Port
  01: 58       Do if port 8 is low
  02: 0        Go to end of Program Table

02:  P91       If Flag/Port (IF A)
  01: 22       Do if flag 2 is low
  02: 30       Then Do

03:  P87       Beginning of Loop
  01: 1        Delay
  02: 0        Loop Count

04:  P32       Z=Z+1
  01: 10       Z Loc [:COMP CTR ]

05:  P86       Do SET CLAMP CURRENT TO COMPASS
  01: 41       Set high Port 1

06:  P4        Excite,Delay,Volt(SE) MEASURE COMPASS
  01: 1        Rep
  02: 5        2500 mV slow Range
  03: 7        IN Chan
  04: 2        Excite all reps w/EXchan 2
  05: 100      Delay (units .01sec)
  06: 2500     mV Excitation
  07: 8        Loc [:COMPASS  ]
  08: .144     Mult
  09: 0        Offset

07:  P86       Do RESET CLAMP CURRENT
  01: 51       Set low Port 1

08:  P89       If X<=>F
  01: 10       X Loc COMP CTR
  02: 3        >=
  03: 10       F
  04: 10       Set high Flag 0 (output)

09:  P80       Set Active Storage Area
  01: 3        Input Storage Area
  02: 8        Array ID or location

10:  P71       Average
  01: 1        Rep
  02: 8        Loc COMPASS
```

```
11:  P91        If Flag/Port (IF B)
  01: 10        Do if flag 0 (output) is high
  02: 30        Then Do

12:  P86        Do
  01: 20        Set low Flag 0 (output)

13:  P86        Do
  01: 12        Set high Flag 2

14:  P30        Z=F RESET COUNTER
  01: 0         F
  02: 0         Exponent of 10
  03: 10        Z Loc [:COMP CTR ]

15:  P86        Do
  01: 31        Exit Loop if true

16:  P95        End (LOOP)

17:  P95        End (END B)

18:  P95        End (END A)

19:  P11        Temp 107 Probe MEASURE TEMPERATURE SENSOR
  01: 1         Rep
  02: 2         IN Chan
  03: 2         Excite all reps w/EXchan 2
  04: 3         Loc [:TEMP C    ]
  05: 1         Mult
  06: 0         Offset

20:  P3         Pulse MEASURE WIND SPEED
  01: 1         Rep
  02: 1         Pulse Input Chan
  03: 21        Low level AC; Output Hz.
  04: 1         Loc [:WIND M/S ]
  05: .0980     Mult METERS/SEC
  06: .001      Offset

21:  P4         Excite,Delay,Volt(SE) MEASURE WIND DIRECTION
  01: 1         Rep
  02: 15        2500 mV fast Range
  03: 1         IN Chan
  04: 1         Excite all reps w/EXchan 1
  05: 5         Delay (units .01sec)
  06: 2500      mV Excitation
  07: 2         Loc [:WIND DEG ]
  08: .1420     Mult DEGREES
  09: 0         Offset
```


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```
22:  P5        AC Half Bridge MEASURE RH
  01: 1        Rep
  02: 5        2500 mV slow Range
  03: 3        IN Chan
  04: 2        Excite all reps w/EXchan 2
  05: 2500     mV Excitation
  06: 4        Loc [:RH %     ]
  07: 871.16   Mult SN 18373  (UNIQUE TO EACH SENSOR)
  08: -351.9   Offset

23:  P8        Excite,Delay,Volt(DIFF) MEASURE BAROMETER
  01: 1        Rep
  02: 4        250 mV slow Range
  03: 3        IN Chan
  04: 3        Excite all reps w/EXchan 3
  05: 1        Delay (units=.01sec)
  06: 2500     mV Excitation
  07: 5        Loc [:PRES MB  ]
  08: 1.2      Mult MILLIBARS
  09: 800      Offset

24:  P10       Battery Voltage
  01: 6        Loc [:BAT VOLTS]

25:  P3        Pulse MEASURE RAIN GAGE
  01: 1        Rep
  02: 2        Pulse Input Chan
  03: 2        Switch closure
  04: 7        Loc [:PRECIP   ]
  05: .01      Mult .01"
  06: 0        Offset

26:  P33       Z=X+Y
  01: 2        X Loc WIND DEG
  02: 8        Y Loc COMPASS
  03: 9        Z Loc [:CORREC WD]

27:  P46       Z=X MOD F
  01: 9        X Loc CORREC WD
  02: 360      F
  03: 9        Z Loc [:CORREC WD]

28:  P34       Z=X+F CORRECT WD FOR TRUE NORTH
  01: 9        X Loc CORREC WD
  02: 0        F
  03: 9        Z Loc [:CORREC WD]

29:  P89       If X<=>F
  01: 9        X Loc CORREC WD
  02: 4        <
  03: 0        F
  04: 30       Then Do
```

```
30:  P34        Z=X+F
  01: 9         X Loc CORREC WD
  02: 360       F
  03: 9         Z Loc [:CORREC WD]

31:  P95        End

32:  P92        If time is
  01: 0         minutes into a
  02: 15        minute interval
  03: 10        Set high Flag 0 (output)

33:  P80        Set Active Storage Area
  01: 01        Final Storage Area 1
  02: 1         Array ID or location

34:  P77        Real Time OUTPUT TIME
  01: 0110      Day,Hour-Minute

35:  P76        Wind Vector OUTPUT AVG WS, WD, AND STD DEV OF WD
  01: 1         Rep
  02: 10        WS, Dir, SD (Polar Sensor)
  03: 1         Wind Speed/East Loc WIND M/S
  04: 9         Wind Direction/North Loc CORREC WD

36:  P71        Average OUTPUT AVG TEMP AND RH
  01: 2         Reps
  02: 3         Loc TEMP C

37:  P70        Sample INST BP AND BV
  01: 2         Reps
  02: 5         Loc PRES MB

38:  P72        Totalize
  01: 1         Rep
  02: 7         Loc PRECIP

39:  P96        Serial Output COPY DATA TO STORAGE MODULE
  01: 71        SM192/SM716
```

Input Location Labels:

1:WIND M/S	4:RH %	7:PRECIP	10:COMP CTR
2:WIND DEG	5:PRES MB	8:COMPASS	11:_____
3:TEMP C	6:BAT VOLTS	9:CORREC WD	12:_____

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SECTION 6. STATION DISASSEMBLY AND MAST RETRACTION

1. Disconnect the sensors from the bulkhead connectors on the enclosure, and the velcro ties from the bottom section of the mast. Remove the crossarm assembly from the mast by loosening the thumb screw on the saddle clamp bracket. Remove the crossarms and secure them, and the crossarm bracket, inside of the fiberglass transit case as shown in Figure 6.0 (remove the solar panel, if present, and secure it in its transit case).

2. Remove the ground wire and clamp from the ground rod and enclosure.

3. Remove the instrument enclosure from the mast. Open the lid and make sure that the velcro ties around the SM192 are tight, the piece of 3/8" foam is between the CR10KD and the battery packs, and the alkaline batteries have been removed. Secure the enclosure inside the transit case using (4) knobs.

*1 40-A
± A

50 49 - P92
01: 540 start time, min
02: interval in min
03:

P75

*68A compile + verify compass
*0 TO PAGE 4-2

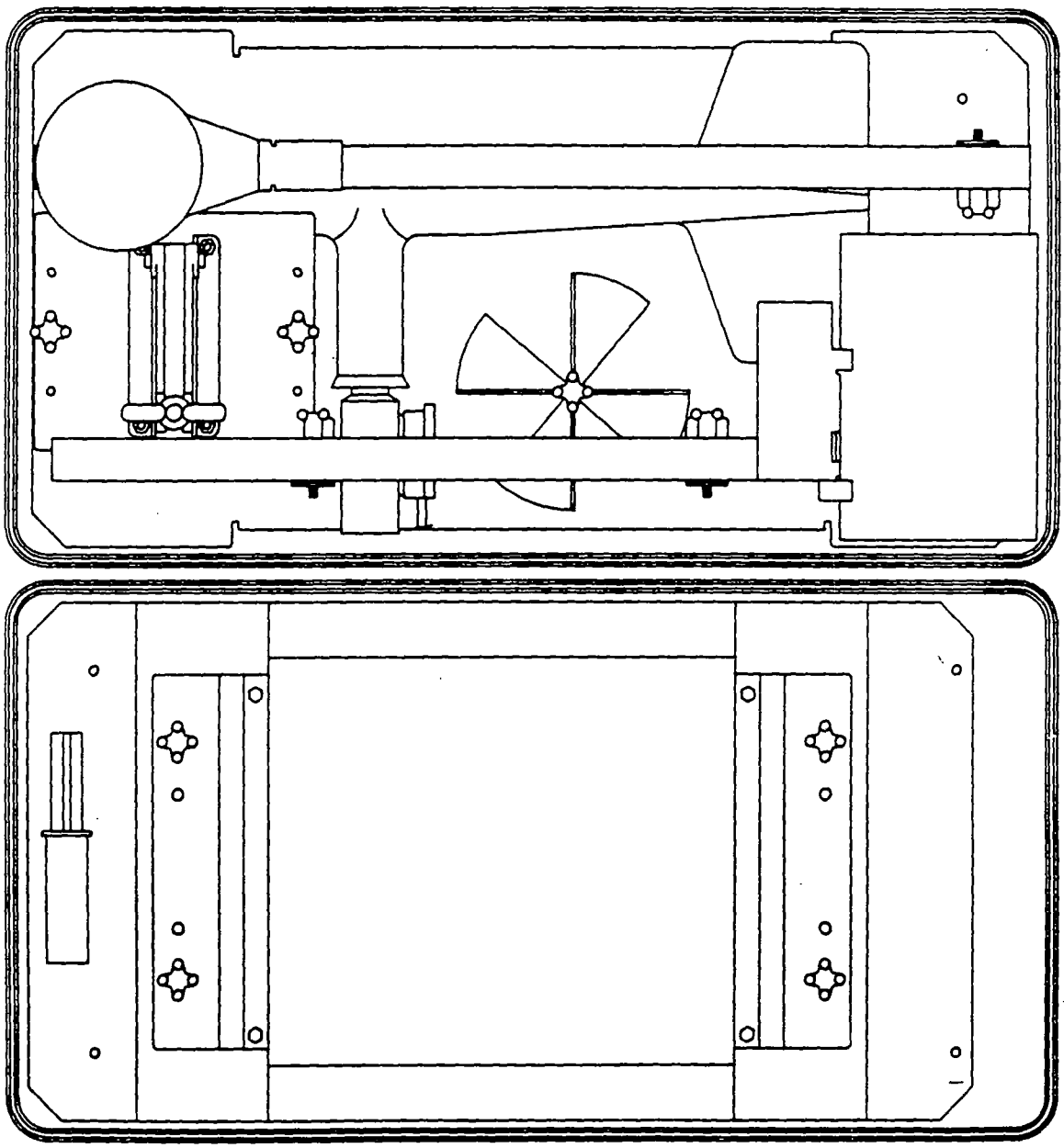

FIGURE 6.0. Components Stored in Transit Case

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4. Close the air release valve on the handpump and the drain valve in the mast base.

5. Re-pressurize the mast using the handpump. When the mast is re-pressurized, release the locking collar on the bottom extended section and bleed air from the air release valve. Continue to bleed air and release the locking collars in turn. When the mast is fully retracted tightened the locking collars to secure the mast. Leave both the air release valve and mast drain valve open.

6. Loosen the clamp on top section of the mast and remove the wind sensor and spigot. Remove the wind sensor from the spigot by loosening the top hose clamp; secure both items in the transit case.

NOTE: Do not remove or loosen the lower keyed ring from the windset spigot. See section 7.0 for calibration procedure.

7. Loosen the bolt on the casting that the legs are attached to. Rotate the mast so that the blue dot is lined up with the split in the casting. While supporting the mast, unscrew each thumbscrew and Rotate the mast until the Unscrew the the thumbscrews on the mast legs. Retract the legs and fit the points on the bottom of each leg into the holes in the mast base. Tighten the thumb-screws to secure the legs, and store the mast inside the pvc case.

SECTION 7. WIND DIRECTION/COMPASS CALIBRATION

The electrical north of the wind direction sensor should be set relative to the compass before the Portable Met Station is deployed. Once this calibration has been done, keyways in the mast sections, aluminum spigot, and wind sensor will maintain the calibrated positions.

NOTE: The compass reading is magnetic north. To have the CR10 report true north, an offset must be entered for magnetic declination (see sample CR10 program, Section 10.0).

Calibration Procedure:

1. Follow steps 1 - 8 in section 2.3 of this manual to setup the mast, enclosure, and wind sensor. Attach the connector on the sensor lead to the bulkhead connector on the bottom of the enclosure.

2. Key the following program into the CR10:

```
*     1          Table 1 Programs
  01: 2          Sec. Execution Interval

 01:  P86        Do
   01: 41        Set high Port 1

 02:  P4         Excite,Delay,Volt(SE)
   01: 1         Rep
   02: 5         2500 mV slow Range
   03: 7         IN Chan
   04: 2         Excite all reps w/EXchan 2
   05: 100       Delay (units .01sec)
   06: 2500      mV Excitation
   07: 8         Loc : Compass reading in degrees
   08: .144      Mult
   09: 0         Offset

 03:  P86        Do
   01: 51        Set low Port 1

 04:  P4         Excite,Delay,Volt(SE)
   01: 1         Rep
   02: 15        2500 mV fast Range
   03: 1         IN Chan
   04: 1         Excite all reps w/EXchan 1
   05: 5         Delay (units .01sec)
   06: 2500      mV Excitation
   07: 2         Loc : wind direction
```

08: .1420 Mult
09: 0 Offset

3. Rotate the mast while monitoring the compass reading (input location 8 in the *6 mode) until the reading is 0 (make sure that the arrow is lined up with the flange).

4. Rotate the wind sensor while monitoring input location 2 until the reading is 0.

5. Check that the wind sensor is aligned with magnetic north using a standard compass.

   If an adjustment is necessary, loosen the hose clamps on the base of the sensor and the plastic key ring. Maintain the sensor's alignment with one hand, and rotate the base of the sensor and key ring with the other hand until input location 2 reads 0. Tighten the hose clamp on the key ring to secure the position.

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SECTION 8. SYSTEM CONFIGURATION FOR RF TELEMETRY

The Portable Meteorological Station equipped with RF telemetry is configured as follows:

8.1 REMOTE STATION

1. Install the crossarm with the antenna in the lower sleeve of the crossarm bracket and connect the cable to the bulkhead connector of the enclosure.

2. Connect the blue SC12 cable to the HT90 radio and the serial I/O port of the CR10.

3. Set the volume and squelch controls as shown in Figure 11.0 (the volume should be turned off when not used). The SDC RF modem, built into the battery pack of the HT90 has a set of dip switches preset at the factory to address 1.

8.2 BASE STATION

1. Connect the PS232 RF Base Station to the serial port of the computer.

2. Attach the magnetic base of the antenna to a metal ground plane such as the roof of a vehicle.

3. Plug the PS232 power cord into an 110V ac outlet and place the switch in the "on" position. The HT90 (mounted inside of the PS232) radio controls are preset at the factory and should not requirement any further adjustments.

4. Configure the Station File for TERM and TELCOM for RF Modem, Path 1.

8.3 TERM AND TELCOM STATION FILES

Station files for TERM and TELCOM must include the RF Modem and Path, as shown below:

```
Interface Device:
#1: RF Modem            Path: 1
#2: END
```

The Path is the address of the Remote DC95 RF Modem, which is set at the factory to 1.

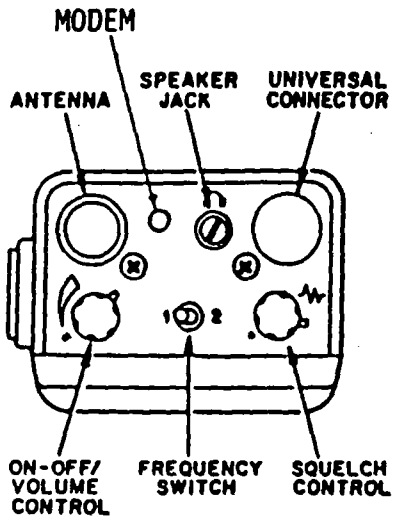

FIGURE 8.0. HT90 Radio Control Settings

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SECTION 9. SENSOR WIRING

Wind Monitor

black of red/black	G
black of green/black	AG
green	1H
black	E1
red	P1
shield	G

Compass

orange	12V
blue	C1
purple	G
green	4H
red	E2
black	AG

Barometer

red	12V
black of red/black	G
green	3H
black of green/black	3L
white	E3
black of white/black	AG
shield	G

Temperature and RH

black	E2
white	2H
green	AG
red	1L
clear	G

Rain Gage

black	G
white	P2

Toggle Switch

red	C8
black	5V